

Expert Session 1 – Workshop1
Commercialisation Roadmap
Perspectives and Gaps for Hydrogen Storage

Early Markets: A pathway towards
industrialization of H₂ storage systems
E. Penfornis, AIR LIQUIDE



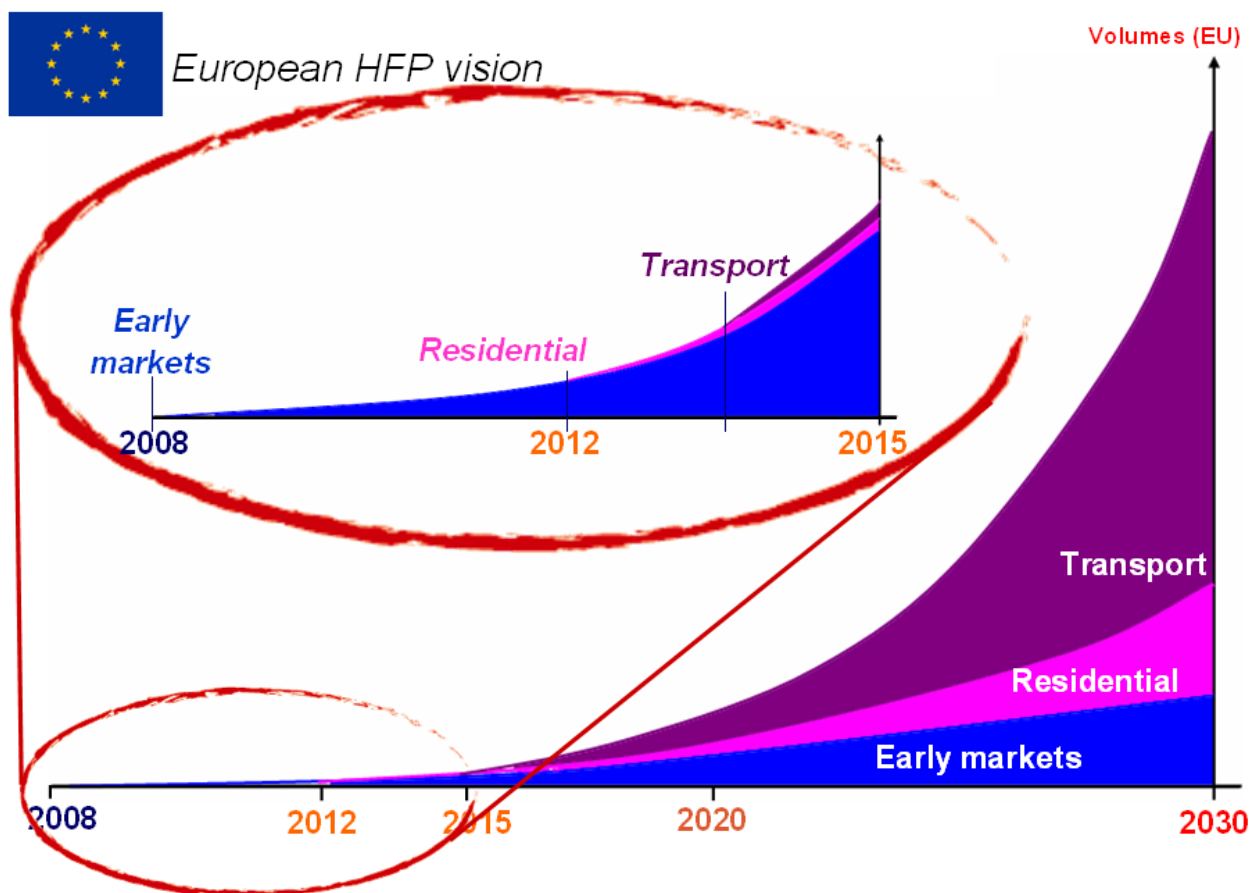
STORHY
FINAL EVENT

June 3-4, 2008
Poissy, France

The role of H2 Energy Early Markets



STORHY



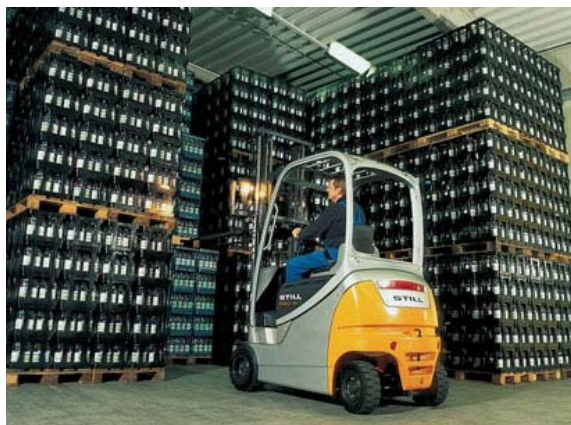
- **More accessible cost and performances targets**

- **Significant market volumes**

The role of H2 Energy Early Markets



Liquid storage



Compressed storage



Solid storage

2015 Potential: x00 000 composite cylinders
Allowing industrialization ahead of transport market roll-out

Synergies with vehicle H2 storage systems



- **Different implementation context than for Transport:**

- Transportable cartridges Vs. Fixed storage
- Cylinders used all along the H2 supply chain



- **Similar technologies for similar objectives:**

- Performance (High Pressure, weight, permeation...)
- Cost
- Safety

- **Opportunity for further synergies:**

- Regulations, Codes & Standards homogenization (Safety Factor)
- Hydrogen filling
- Industrialization
- High pressure H2 regulator & valve technology
- ...



Cylinder developments required for Early Markets



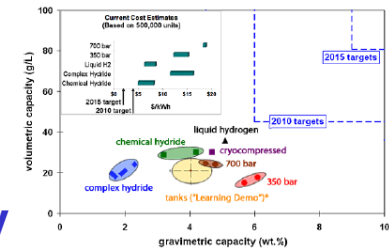
STORHY

- **Technologies**
 - Liner
 - Filament winding
 - Industrialization
 - H2 filling
- **Materials**
 - Polymers
 - Composite fibers
- **RCS**
 - Safety Factor
 - Aging monitoring
- **Functionalities**
 - HP Valve for public use
 - Sensors



- **Cost**
 - Production
 - Maintenance
 - Lifetime

- **Performance**



- **Safety**



- **Ergonomy**

Conclusions



- **Other applications than conventional Transport can justify developments of HP composite cylinders, with earlier deployment perspectives**
- **Some clear synergies appear between cylinder needs for Early Markets and Transport**
- **Need for a « win-win » approach between the 2 markets, through integration by involved players (industrial companies, academics, RCS bodies...) of both sets of constraints**